STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0435

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COMMISSIONER

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GOVERNOR

May 26, 2020

Via Electronic Mail to NEPA.Comments@npo.doe.gov
Attn: Terri Slack, Field Counsel
National Nuclear Security Administration
P.O. Box 2050
Oak Ridge, TN 37831

Dear Ms. Slack:

The Tennessee Department of Environment and Conservation (TDEC) appreciates the opportunity to provide comments on the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) Draft Supplement Analysis (SA), which presents an analysis of the potential impacts of earthquake accidents at the Y-12 site based on updated seismic hazard information.[1] Based on the Draft SA, NNSA has preliminarily determined that: (1) the earthquake consequences and risks do not constitute a substantial change; (2) there are no significant new circumstances or information relevant to environmental concerns; and (3) no additional NEPA documentation is required at this time.[2] TDEC has reviewed the Draft SA and provides the following comments:

General

The Probabilistic Seismic Hazard Analysis (PSHA) presented in the SA incorporated the results from two reports:

1. Central and Eastern United States Seismic Source Characterization for Nuclear Facilities (CEUS SSC). The CEUS SSC project was completed in 2012 and published by the NRC as NUREG-2115.
2. Central and Eastern North America Ground-Motion Characterization – NGA East Final Report. The Next Generation Attenuation East study was completed in 2018 and published by the Pacific Earthquake Engineering Research Center as Report No. 2018/08.

A PSHA considers a range of regional and site-specific geologic information to better characterize local seismic sources and establish facility site conditions in order to develop the design response spectra for all frequencies of ground motion. Understandably, this can be a moving target, because new and/or updated geologic information may alter the results of an existing PSHA.

[1] The Draft SA was prepared in accordance with the DOE procedures implementing NEPA (10 CFR 1021) that require that "[when] it is unclear whether or not an Environmental Impact Statement (EIS) supplement is required, DOE shall prepare a Supplement Analysis [that] shall discuss the circumstances that are pertinent to deciding whether to prepare a supplemental EIS pursuant to 40 CFR 1502.9(c)" (10 CFR 1021.314).
[2] The Draft SA sought to determine whether the Y-12 SWEIS (DOE/EIS-087) should be supplemented, a new SWEIS is warranted, or if no further NEPA documentation is required.

Y-12 is in one of the most active seismic regions in eastern North America, known as the East Tennessee Seismic Zone (ETSZ). This northeasterly trending belt of seismicity is host to small (Mw[3] < 5) earthquakes over an area that is 300 km (186 mi.) long by less than 100 km (62 mi.) wide, within the Valley and Ridge and Blue Ridge physiographic provinces of eastern Tennessee and parts of North Carolina, Georgia, and Alabama. In relying upon the 2012 NUREG-2115 report (which recognized the ongoing investigations into the Quaternary earthquake history in the ETSZ), the draft SA does not take into consideration more recent investigations (post-2012) into the Quaternary faulting history in the ETSZ:

- Cox, R.T., Hatcher, R.D., Jr., Counts, R., Gamble, E., Glasbrenner, J., and Warrell, K., 2018, Quaternary faulting along the Dandridge-Vonore fault zone in the Eastern Tennessee seismic zone, in Engel, A.S., and Hatcher, R.D., Jr., eds., Geology at Every Scale: Field Excursions for the 2018 GSA Southeastern Section Meeting in Knoxville, Tennessee: Geological Society of America Field Guide 50, p. 81-94, https://doi.org/10.1130/2018.0050(06)
- Warrell, K.F., 2013, Detailed geologic studies of paleoseismic features exposed at site in the East Tennessee seismic zone: Evidence for large, prehistoric earthquakes (Master's Thesis): Knoxville, University of Tennessee, 107 p.
- Warrell, K.F., Cox, R.T., Hatcher, R.D., Vaughn, J.D., and Counts, R., 2017, Paleoseismic evidence for multiple Mw>6 earthquakes in the East Tennessee seismic zone during the late Quaternary: Bulletin of the Seismological Society of America, v. 107, p. 1610-1624, https://doi.org/10.1785/0120160161

Recent literature suggests that a more powerful earthquake (Mw > 6) is possible in the ETSZ or surrounding fault zones that could impact the Uranium Processing Facility (UPF) at Y-12. Observations of faults in the Dandridge-Vonore fault zone are interpreted to indicate that much larger earthquakes (Mw > 6) have occurred in this area in recent geologic time (in the past 16,000 years) (Cox et al. 2018, Warrell et al. 2017). If correct, then there is the potential for extremely destructive earthquakes in the ETSZ close to the Oak Ridge area.

The Y-12 SWEIS Earthquake Accident SA references NUREG-2115 released in 2012. NUREG-2115 stated "*…recent and ongoing studies of faults in the vicinity of the ETSZ postulate that these faults are related to the zone either as causative faults or as secondary faults resulting from displacement on faults at depth (see Section 7.3.4). However, these postulated associations are judged to lack definitive support for use in this SSC model as a result of the preliminary nature of the studies*" (p.7-3). Furthermore, the ETSZ was classified as having "Insufficient Quaternary Deformation" (see Figure A-66, on p. A-116). As previously stated, the more recent work of Cox et al. (2018) hypothesizes that that there is deformation of Quaternary sediments from fault movements associated with the ETSZ. TDEC recommends that the ETSZ be reclassified and referenced accordingly, because the inclusion of this new data may change some of the other parameters used in the Probabilistic Seismic Hazard Analysis.

TDEC recommends that the final SA reflect the more recent body of work on the ETSZ and analysis accounting for quakes that exceed Mw 5, accounting for quake magnitudes greater than Mw 6, consistent with new research. It should be noted that at Mw 6 level, there is major damage to most buildings, and the energy associated with a quake of this magnitude is significantly greater than a Mw 5, the high value reported in the USGS 2008 and 2014 reports.[4]

[3] Moment magnitude scale.

[4] TDEC offers the following specific locations within the draft SA that would require modification to reflect this more current research: **Section 2.2, Facilities and Site-Specific Probabilistic Seismic Hazard Analysis, p. 9, 3rd paragraph:** "*…CEUS SSC analysis; and the local geologic data.*" TDEC encourages NNSA to update the reference to local geology with the latest data and information from Cox et al. (2018), referenced above in the General Comments. **Section 3.2, Potential Environmental Impacts and Comparisons, UPF,** on p. 14 in the last paragraph NNSA states in referring to large quakes,

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Section 3.1, Introduction and Technical Approach, on p. 13, in the 4th full paragraph DOE notes that "*Should such an accidental release occur, the radioactive gases and aerosols in the plume would be transported by the prevailing wind while dispersing in the atmosphere.*" Based on information in Appendix A, it appears NNSA evaluated the distribution of wind speed and direction and then modeled transport, dispersion, and deposition of the radioactive contamination based on that distribution. If this understanding is correct, the model essentially assumes the plume will migrate primarily in the *prevailing* wind direction during and immediately after an accidental release.[5]

Actual wind speeds and directions, which may vary over time, would drive radioactive plume transport, as well as the degree of dispersion and the locations of deposition within the community. These factors directly affect the distance and exposure of the maximally exposed individual (MEI) and possible disproportionate effects on minority and low-income populations, as discussed in comments below.

TDEC encourages NNSA to clarify this approach in the final SA body and its appendices and how NNSA evaluated the possibility that that wind might blow in directions other than the prevailing direction during and immediately after an accidental release.[6]

Section 3.2.4, Environmental Justice Impacts, on p. 22, in the 1st full paragraph NNSA states "*Because the nearest minority populations and low-income populations are located approximately 15 miles east of Y-12 (see Figures 3-1 and 3-2), potential accidental doses at those locations would be even less than the MEI dose…. Consequently, NNSA has concluded that there would be no disproportionately high and adverse human health impacts on minority populations and low-income populations from an earthquake accident at the UPF, 9215 Complex, or the 9204-2E Facility.*"

As noted in comments above, it is unclear how NNSA evaluated the possibility that that wind might blow in directions other than the prevailing direction during and immediately after an accidental release. The Scarboro community lies immediately adjacent to the Y-12 boundary, about 0.4 miles north of the UPF, but not in the direction of prevailing winds. The evaluation of potential dose to minority and low-income populations may be biased low by evaluating communities in downtown Knoxville, 15 miles east of Y-12, instead of the adjacent Scarboro community.

The criterion in Figure 3-1 evaluates potential effects on census tracts with more than 50-percent minority populations. Guidance produced by the Council on Environmental Quality provides a second definition, "the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population,[7]" which is more appropriate for Y-12 given the proximity of Scarboro to

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"*which equates to the occurrence of such an accident occurring once every million years (CNS, 2020b).*" Previously in the paragraph, there is an "*every 2,500 year*" prediction, referring to lesser magnitude quakes. Information from the Cox et al. (2018) paper suggests this may need to be re-evaluated. Since there is recent evidence that $M_w \geq 6$ quakes (significantly more powerful than M_w 5 quakes used in the current analysis) have occurred in the area in the last 16,000 years, the large quake potential may be underestimated and this evaluation should be updated using the most recent data and information.

[5] Various TDEC regulatory programs use tools for modeling wind direction and associated probabilities. TDEC would be happy to provide additional information to NNSA on these approaches.

[6] Beyond the specific section noted, Appendix A, Technical Approach for the Earthquake Accident Analysis, p. A-3, 5th (final) paragraph may require revision.

[7] See *Community Guide to Environmental Justice and NEPA Methods* (March 2019) and the Council on Environmental Quality's December 1997 guidance, *Environmental Justice Guidance Under the National Environmental Policy Act.*

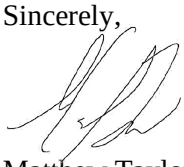
Y-12. The EPA Environmental Justice Screening and Mapping Tool[8] shows that Scarboro falls within the 70- to 80-percentile range for minority population based on state percentiles (50- to 60-percentile range based on national percentiles). Scarboro also falls within with the 80- to 90-percentile range for low income population based on state and national percentiles.[9]

As presented in the draft document, it is unclear whether NNSA fully evaluated the possible radiation dose to minority and low-income populations following an accidental release. If the wind were blowing toward the north, the Oak Ridge community receiving the dose (Scarboro) would be about 37 times closer than the Knoxville communities evaluated in the model—i.e., about 0.4 miles from the release instead of 15 miles. TDEC encourages NNSA to clarify in the body of the document and appendices how it is evaluating the possible dose to Oak Ridge residents in the Scarboro community.[10]

Appendix B, Section 5, Consequences – Nuclear Criticality, p. B-15, 3rd paragraph: "DOE has taken credit for: "*Distance and shielding (e.g., containers, process equipment, and the walls of the facility)…*" A more conservative tact would be to assume no shielding and possibly zero distance at the DOE boundary. When modeling for risk associated with emergency situations, planning for the worst case scenario (no shielding and minimal distance) is a more conservative approach, especially given the proximity of the Scarboro community to the UPF (0.4 mi) and risk to MEIs in the area should actual wind speeds and direction differ from prevailing winds at the time of an emergency or release (referenced in the specific comments). There is precedent for such conservative risk modeling at the Environmental Management Waste Management Facility (EMWMF) in Oak Ridge that was approved by TDEC, DOE, and EPA in the early 2000s."

TDEC appreciates the opportunity to comment on this Draft SA. Please note that these comments are not indicative of approval or disapproval of the Draft SA nor should they be interpreted as an indication regarding future permitting decisions by TDEC. Please contact me should you have any questions regarding these comments.

Sincerely,



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cc: Kendra Abkowitz, PhD, TDEC, OPSP
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[8] EPA Environmental Justice Screening and Mapping Tool, https://ejscreen.epa.gov/mapper/, 2010 census data accessed, April 27, 2020

[9] Based on data accessed at https://www.census.gov/data.html on April 17, 2020, Census Tract 201, which includes Scarboro, has the highest minority population (40%) in Anderson County. Five of the six Anderson County census tracts with the next highest minority populations lie adjacent to Tract 201, including 202.01 (21%), 202.02 (13%), 205 (11%), 206 (10%), and 204 (9%).

[10] Beyond the specific section noted, Appendix A, Technical Approach for the Earthquake Accident Analysis, P. A-3, 4th paragraph may require revision.